3.5 Achieving Situation Awareness is the Primary Challenge to Optimizing Building Movement Strategies

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Understanding how strategies that protect building occupants can best be selected and effectively deployed is a critical task for a research agenda that tackles the problem of when, where and how to move people during an emergency. Of course, this is not the only obstacle to effective use of building emergency strategies. Physical engineering that supports various strategies (e.g., pressurization of spaces in response to the interior and exterior locations of hazards) is of critical importance. Communicating recommended responses to building occupants is of critical importance. Nonetheless, perhaps the most challenging obstacle for building managers and occupants concerns the problem of initially assessing the situation and selecting the appropriate strategy.

The challenge is great. The chaotic and dynamic nature of building emergencies requires an exceedingly rapid assessment of the situation. The timeframe is measured in seconds and minutes, not hours and days. The rapid onset of many events means that the process should be well underway before emergency responders arrive at the building.

Human factors professionals have been actively researching this problem under the generally accepted term of "situation awareness." Endsley (1988) has provided a well-accepted definition: "The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future." As noted in the definition, it is insufficient to understand the momentary status of the situation; projecting its development is of great importance in choosing a strategy to safeguard building occupants.

A closely related body of research and theory from the human factors field can be loosely classified under the labels of "cognitive task analysis" and "cognitive task design." The former term has been defined by Schaaftal and Schraagen (2000): "A cognitive task analysis is an analysis of the knowledge and skills required for a proper performance of a particular task. The framework consists of three elements: (a) an analysis of the task that has to be carried out to accomplish particular goals…, (b) an analysis of the knowledge and skills required to accomplish these tasks…, and (c) an analysis of the cognitive (thought) processes of experienced and less experienced [persons]."

We need to learn how to design systems that help persons in positions of managing an emergency in their efforts to achieve an acceptable level of situation awareness. The task of designing systems that help emergency managers and responders achieve an acceptable level of situation awareness is technically complicated and challenging. The task must be approached from an interdisciplinary perspective, as exemplified by the following insight: these systems will have to include both technological and human components working in concert. Of considerable importance is the concept of "distributed cognition" or "joint cognitive systems" whereby data is collected, analyzed and represented using a variety of agents, human and otherwise. Significant

amounts of information may need to be collected, compiled, analyzed and presented within a very short time frame, a task at which technology excels. However, severe emergencies are inherently chaotic and uncertain where the meaning of information from disparate sources (including people) must be quickly synthesized and interpreted, a task at which people excel. Designing systems will require the "functional allocation" of these tasks to the agents, both technological and human, that perform them best.

Progress in helping building management and emergency responders achieve situation awareness will require a fundamental change in how we approach the design of building protection systems. At present, our buildings are not well designed to achieve the needed level of situation awareness, despite the availability of many technological tools. Addressable detection devices can pinpoint the locations of detection of hazards, but the building interfaces used to display the information does not supply an immediately comprehensible understanding of the situation. Technological devices like CCTV cameras and smoke detectors are not deployed in ways that help building management and emergency responders understand the status of key egress systems like stairs and corridors.

Research and development towards the support of situation awareness in buildings is a priority. Providing designs that protect building spaces and move people is essential, but the value of such efforts is limited to the extent that we fail to support the people who must decide when and how to use these features.

References

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